SR-112
Time Code Distripalyzer

Owner's manual
Version 2.00_104
June 2013

All materials herein © Brainstorm Electronics, Inc.

Brainstorm Electronics reserves the right to change or modify the contents of this manual at any time.

Credits
Concept: AID, Brainstorm Electronics
Software: Gerry Lester
Manual: Bernard Frings, Gerry Lester
Technical Assistance: Jim Pace

Brainstorm Electronics, Inc.
www.brainstormtime.com

Table of contents

1. INTRODUCTION 3
2. INSTALLATION 3
3. I/O'S DESCRIPTION AND CABLE REQUIREMENTS 4
4. QUICK START 5
5. FRONT PANEL DISPLAY & LED'S 5
    LCD Display 5
    Time Code Reader 6
    Generator LED's 6
    Status LED's 6
    Warning LED's 6
    Power LED's 7
6. SET UP, NAVIGATION & ENTER KEYS 7
7. MENU NAVIGATION 8
8. MENUS DESCRIPTION 9
    01- Mode 9
    02- Output Rise Time 9
    03- Output Levels (menus 03-05) 9
    06- Beeper 9
    07- Video Phase Threshold 9
    08- Video Drift Threshold 10
    10- Time Code Generator (menus 10-29 reserved for TCG option) 10
    91- Ethernet (Menus 91-94 used for Ethernet settings) 10
    98- Feature Key 10
    99- SR-112 Software version & Serial No 10
9. NON-VOLATILE STORAGE 11
10. RESHAPING AND DISTRIBUTING TIME CODE 11
    Time Code Distribution 11
    Reshaping Distorted Time Code 11
    Time Code Level 11
    Selecting The Proper Rise Time 11
11. TIME CODE ANALYZER 12
    Format and Frame Rate 12
    Video Phase 12
    Time Code Errors 14
    Time Code Report 15
    Reset 16
12. ETHERNET 16
    Ethernet IP Settings 16
    SR-112 Web Page 16
    SR-112 Settings 16
    Loader 17
    Programming Sequence 18
13. USER BITS 19
14. APPENDIX 20
    A. Time Code Error Messages 20
    B. Video formats supported by the SR-112 21
    C. Pinout Diagram for D25 connector 21
    D. Longitudinal Bit Assignment: SMPTE and EBU 22

1. Introduction

Congratulations on purchasing the SR-112 Time Code Distripalyzer. The SR-112 combines several functions in one unit including most of the functions of the Brainstorm SR-15+ and, with the TCG option installed, of the SR-3.

- The Distributor reshapes time code and distributes it through its 12 individually buffered outputs;

- The Analyzer identifies the type, the stability and the frame rate of the incoming time code; it verifies its proper synchronization (phase) with video; and it reports time code errors (drop outs...)

- The Generator (optional software) repairs damaged time code by jam-syncing and generates new time code genlocked to video or not

- The Ethernet port lets you connect to the SR-112 using standard TCP/IP protocol to access the unit remotely and to update its firmware.

2. Installation

2.1. UNPACKING

When unpacking your SR-112 the following items should be in the shipping carton:

- SR-112 unit
- Universal Power Supply (12VDC @ 16w)
- IEC power cable
- Owner's Manual & Registration card

2.2. INSTALLING THE SR-112

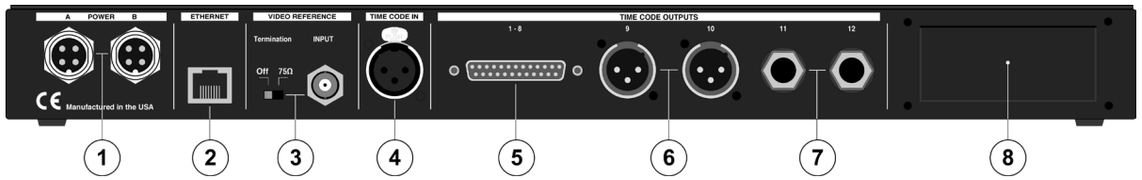
The SR-112 is designed to be mounted in a standard 19" rack. It requires 1U in height.

Usual precautions should be respected when wiring the SR-112: use high quality cables with good shield to guarantee a good signal transmission. Keep your cables as short as possible.

To preserve the integrity of the transmission line, it is recommended that you do not 'mult' a single output to multiple devices as it can degrade signal quality.

The video reference needs to be properly terminated. If the SR-112 is the last device in the chain, turn on the 75Ω termination switch on the rear panel. If you are looping through using a 'T' connector, turn off the termination switch and make sure there is a 75Ω termination at the end of the chain.

3. I/O's Description and Cable Requirements



3.1 POWER

The SR-112 requires 12VDC @ 18W. Acceptable range is 12VDC +/-15%.

The external supply provided with the SR-112 accepts 100 to 240 VAC input at 50 - 60 Hz so it is suitable for use anywhere in the world.

Optionally, a second power supply can be connected to Power Input B for redundancy. To order a second power supply contact your dealer.

➢ Insert the 4 pin plug into the rear panel jack and secure by screwing the ring. Plug the supply into the wall using the standard IEC cable supplied.

3.2 ETHERNET

The Ethernet port is used to connect the SR-112 via TCP/IP protocol to access the unit remotely and to upload firmware from any computer on the network.

Connector: RJ45 jack

➢ Use a standard Ethernet cat5 cable with RJ45 plugs.

3.3 VIDEO REFERENCE INPUT & TERMINATION SWITCH

Input accepts HD and SD sync (see Appendix A for a list of supported formats). Switch enables 75Ω termination. Use when if SR-112 is at the end of the chain.

Connector: BNC

➢ Use a standard 75Ω BNC cable.

3.4 TIME CODE INPUT

Accepts any time code format at speeds ranging from 1/30x to 60x playspeed.

Connector: XLR female

➢ Use a standard audio cable, Pin #2 Hot. Balanced or unbalanced systems.

3.5 TIME CODE OUTPUTS 1-8

Connector: 25 pin D Female (See Appendix C for wiring diagram)

➢ Use standard Tascam/Avid (Digidesign) analog audio pin out configuration and if needed, a readily available DB-25 male to 8 XLR male break-out cable from third party companies.

3.6 TIME CODE OUTPUTS 9-10

Connector: XLR male (x2)

➢ Use standard audio cables, Pin #2 Hot. Balanced or unbalanced systems.

3.7 TIME CODE OUTPUTS 11-12

Connector: 1/4" stereo (x2)

➢ Use standard audio cables with a Tip/High, Ring/Lo, Sleeve/Ground configuration. Balanced or unbalanced systems.

3.8 SLOT FOR FUTURE OPTION CARDS

4. Quick Start

You should read this manual to familiarize yourself with the SR-112 features. The following simple steps are only provided to get you started right away.

NOTE: The SR-112 reshapes and distributes time code. With a software upgrade (TCG), it also repairs and generates time code. For instructions on those features, please refer to the TCG manual.

Connect the power supply to the Power A jack and plug the IEC cable into a wall outlet. Then tap the front panel power switch to turn on your unit (there will be a small delay, approx. 2 seconds, before the front panel actually turns on).

Connect your time code source to the XLR TC input and, if available, connect your video reference to the video input BNC. Out of the box, the SR-112 is set to reshape and distribute your time code source through its 12 outputs. Output levels are set to 0dBU.

5. Front Panel Displays & LED's

5.1. LCD DISPLAY

The 32 characters LCD display has 5 different status pages: Time Code In, Video, User Bits, Video Phase and Errors.

To access these different pages, press the [UP] or [DOWN] key.

• TIME CODE IN

Displays the type of time code (bottom line, left), the format (bottom line, center) and the frequency (bottom line, right).

Time Code formats are 30DF, 30ND, 25 and 24 f/s code.

The frequency counter has 3 decimals.

• VIDEO FORMAT

Displays the format and the rate of the video reference.

See Appendix B for a list of supported video formats.

• USER BITS

Displays the User Bits and the User Bits type. See chapter 13 for more info.

• VIDEO PHASE

Displays the phase between time code and the video reference by indicating the time code bit lined up with Video Sync. Ideally it should read '+000.0°'.

See 11.2 for more on video phase.

• TIME CODE ERRORS

Displays the last 50 time code errors since the last reset. The first line has a description of the error, the second the faulty time code address. To scroll through the different errors, press the [LEFT] and [RIGHT] keys.

The left/right arrows are only present when there are more errors in that direction. Right = increasing time codes; Left = decreasing.

The display normally shows the most recent error, but arrowing to the left will hold it at the error being viewed. It will return to displaying the most recent error if the operator either (a) arrows all the way to the right, or (b) switches to a different display and back (e.g. to the TC In Status display, or to a Menu).

For a complete list of errors see Appendix A.

5.2. TIME CODE READER (8 DIGIT NUMERIC DISPLAY)

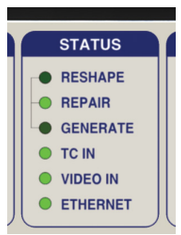
The reader displays the incoming time code in hours, minutes, seconds and frames.

It also momentarily flashes an error description when errors are detected such as drop outs...

5.3. GENERATOR LED'S

Please refer to the TIME CODE GENERATOR manual for information on these LED's.

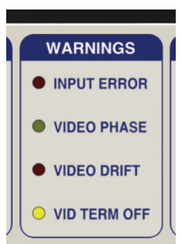
5.4. STATUS LED'S



- The top 3 LED's indicate the selected operation mode: Reshape / Repair / Generate.
  Only one of these LED's can be on at a time.
  Note: Repair and Generate are only available when the optional TCG software has been installed.

- The bottom 3 led's (TC In, Video In, Ethernet) light up when a valid signal is present at the corresponding port.

5.5. WARNING LED'S



- Input Error: Flashes to indicates an error was detected. To view this error, go to the ERROR page on the LCD display (see 5.1 above). To clear, press any key.

- Video Phase: Indicates that Video and Time Code are

locked with an offset (out of phase).
Go to 11.2 for more information on Video Phase.

- Video Drift: Indicates that Video and Time Code are not locked

- Video Term Off: Indicates that the 75Ω Video Termination has been switched off on the rear panel. Termination should be switched on when the SR-112 is the last unit on the video line; when using a 'T' to loop through, it should be off.

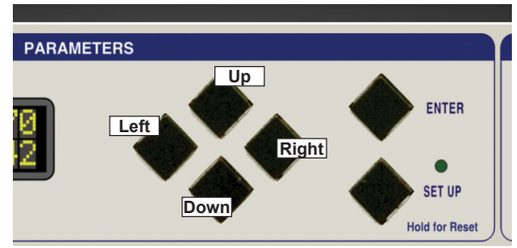
5.6. POWER LED'S

When the SR-112 is turned on, the Power A and Power B LED's light up to indicate that power is present at the corresponding connector. When the SR-112 is turned off, these LED's stay off, even with power present at the connector.

When using 2 power supplies, if one of the 2 fails, the corresponding LED will flash.

6. Navigation Keys

6.1. SET UP KEY



The Set Up mode is used to change parameters.

To enter the Set Up mode, press the [SET UP] key.

While in Set Up mode, the SET UP LED is on.

To exit the Set Up mode, simply press the [SET UP] key again.

Note: Holding the [SET UP] key for 3 seconds or more will reset the SR-112 (see page 15 for more on Reset).

6.2. ENTER KEY

In SET UP mode, scrolling through the different values will not affect anything. Only after the [ENTER] key is pressed will a change take place.

When exiting a menu without pressing the [ENTER] key, the changes are lost.

6.3. UP, DOWN, LEFT, RIGHT KEYS

These 4 keys are directly right of the LCD display. They are not labeled as such because their function is fairly obvious.

The [LEFT] and [RIGHT] keys are used to move to a different field while the [UP] and [DOWN] keys are used to change a value.

The [UP] and [DOWN] keys are also used to move to another menu or page.

7. Menu Navigation

7.1. SELECTING A MENU

When entering the Set Up mode, the LCD display switches to the Set Up menu last used, with the cursor on the far left position in the upper line. The cursor position is indicated with a '>' character, implemented as inverse video, flashing on and off.

To move to another menu, with the cursor on the upper left position, press the [UP] or [DOWN] key.

7.2. CHANGING VALUES

To edit one of the fields on the current menu, press the [RIGHT] or [LEFT] key to move the cursor to the desired field. Then, press the [UP] or [DOWN] key to change the value.

Note that no change will take effect until the [ENTER] key is pressed. When exiting a menu without pressing the [ENTER] key, the changes are lost.

7.3. THE CURSOR

The cursor position is indicated with a '>' character, implemented as inverse video, flashing on and off..

After a value is edited, the cursor changes to a solid triangle, until the [ENTER] key is pressed.

If the cursor is moved to another field without pressing the [ENTER] key first, the solid triangle stays in front of the edited field to indicate a change was made but not entered yet.

7.4. STATUS VALUES

Throughout the different menus, values appear in the display enclosed in square brackets. These are status values.

Status values are the values actually obtained, based on a menu selection such as the output rise time in menu 04.

8. Menus Description

8.1. MENU 01: MODE

The SR-112 has 3 different operating modes:

- Reshape
- Repair
- Generate

Note: *Menu 01 only appears when the TCG software option has been installed since, without it, Reshape is the only mode available.*

8.2. MENU 02: OUTPUT RISE TIME

Three different waveforms are available for the time code outputs: square, SMPTE and EBU. The square wave has a 1µs rise time; SMPTE 25µs; EBU 50µs. Menu 04 lets you select one of these 3 waveforms. This is a global selection for all 12 outputs.

See 10.4 for more on rise time.

8.3. MENUS 03-05: OUTPUT LEVELS

These three different menus (03, 04, 05) are for adjusting the levels of the 12 outputs.

Levels go from full off to +12db (0 to 50 on the LCD). With a balanced output, 12 is approximately 0dBU; with unbalanced, 24 is.

NOTE: For menu 05, it is not necessary to hit the [ENTER] key. The changes take place instantly.

8.4. MENU 06: BEEPER

Menu 06 enables you to turn the beeper on or off.

8.5. MENU 07: VIDEO PHASE THRESHOLD

Menu 07 is for changing the threshold at which time code is considered out of phase with video (and lights up the Video Phase LED). See 11.2 for more info.

8.6. MENU 08: VIDEO DRIFT THRESHOLD

This menu is for changing the threshold at which time code is considered drifting relative to video (and lights up the Video Drift LED). See 11.2 for more info.

8.7. MENUS 10-29: TIME CODE GENERATOR

Menus 10 through 29 are assigned to the optional Time Code Generator and are only available if the TCG software has been installed.

For more information on these menus, please refer to the TCG manual.

8.8. MENUS 91-94: ETHERNET

DHCP stands for Dynamic Host Configuration Protocol.

When the DHCP option is turned on, the DHCP server automatically assigns an IP address to the SR-112. It also assigns other IP configuration parameters, such as the subnet mask and the default gateway.

When DHCP is on, menus 92, 93 and 94 become status menus, displaying the IP Address, Mask and Gateway but not allowing you to change them.

If DHCP is off, then the IP address, mask and gateway need to be entered manually in menus 92, 93 and 94.

8.9. MENUS 98: FEATURE KEY

Menu 98 lets you enter a unique key to authorize certain features on your SR-112, such as the TCG.

8.10. MENU 99: SOFTWARE VERSION & SERIAL NUMBER

This menu is status only and indicates the current firmware version and the unit's serial number.

IMPORTANT NOTE ON MENU OPERATION: Remember to always press the [ENTER] key to save your settings prior to exiting a menu or to exiting the SET UP mode. No change will take place until the [ENTER] key is pressed.

9. Non-Volatile Storage

The SR-112 has non-volatile memory holding the current settings. This includes Mode, Beeper Setting, Output Rise Time, Output Levels, Video Phase Threshold and Video Drift Threshold. This memory is continuously updated so that, when the unit is turned on, it is in the same condition as it was when powered down.

NOTE: You should wait approximately 10 seconds after a change was entered before powering down, to allow for the flash memory to be updated.

10. Reshaping and distributing time code

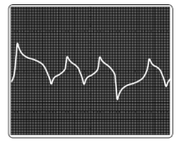
10.1. TIME CODE DISTRIBUTION

Simply multing a time code source can cause serious problems and is not recommended.

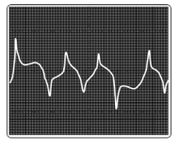
The SR-112 eliminates these potential problems by providing 12 individually buffered and balanced outputs.

10.2. RESHAPING DISTORTED TIME CODE

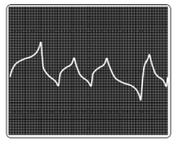
On older analog tape machines (especially VTR's), time code usually has improper rise/fall times, leading edge peaking and different amplitude levels on "one's" and "zero's" (see diagrams below). This is due to the fact that analog tape machines were not designed to record a signal that is basically digital.



Analog tape machine Play Speed



Analog tape machine High Speed



Analog tape machine Low Speed

As a result, time code could become unreadable.

The SR-112 eliminates these amplitude distortions by reshaping the code to its original SMPTE or EBU specifications.

10.3. TIME CODE LEVEL

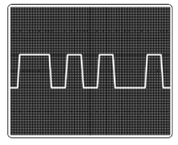
Level fluctuations or improper level can also render time code unreadable.

With the SR-112, each output level is individually adjustable so that optimum levels can be sent to each reader. These levels remain constant regardless of input level fluctuations.

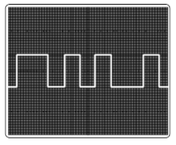
10.4. SELECTING THE PROPER RISE TIME

Rise time limiting was specified in SMPTE and EBU to minimize crosstalk from time code into audio. A longer rise time removes more high frequency components from its waveform. However some equipment may not be able to read time code if its rise time is too long.

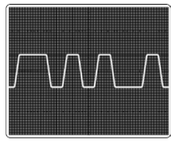
The SR-112 has three preset rise times for its output waveform: 25 µsec (SMPTE), 1µsec (square wave) and 50µsec (EBU).



Reshaped Code
SMPTE setting (25us)



Reshaped Code
Square setting (1us)



Reshaped Code
EBU setting (50us)

As a general rule, if time code is patched directly into a reader, use the square wave position; but, whenever possible cross-talk problems exist (i.e. in an audio patchbay...) or when recording the reshaped signal, use the SMPTE or EBU setting (as needed).

11. Time Code Analyzer

The Analyzer section has 3 main functions:

- to identify the format and frame rate of the incoming time code;
- to verify the proper synchronization (phase) with video;
- to detect and report time code errors

11.1. TIME CODE FORMAT AND FRAME RATE

The LCD display indicates the format and the frame rate (or frequency) of the incoming code. For example: 30DF @ 29.970f/s.

Format vs. Frame Rate:

It is important to understand that format and frame rate are not always the same.

- The frame rate, in this case, is a frequency. If the speed varies, the frame rate varies. For example, if a machine was running 5% too fast, a format of 24 fr/sec would have a frame rate of 25.20 fr/sec.

- The format on the other hand does not deal with frequency and stays the same, regardless of the speed. It is a way of counting.

There are 3 time code formats:

at 30 fr/sec, the frame sequence is: 28, 29, 00, 01, etc...
at 25 fr/sec, the frame sequence is: 23, 24, 00, 01, etc...
at 24 fr/sec, the frame sequence is: 22, 23, 00, 01, etc...

29.97 vs. Drop Frame

In addition there is a format variation called Drop Frame used with 30f/s code, which is not to be confused with 29.97. 29.97 indicates a rate (frequency) and drop-frame indicates a format (count).

When generating 29.97 time code, the generator locks to a field rate of 59.94 Hz (NTSC color rate) and pulls down the frame rate by .1% to 29.97. But the format or frame count remains 30 fr/sec.

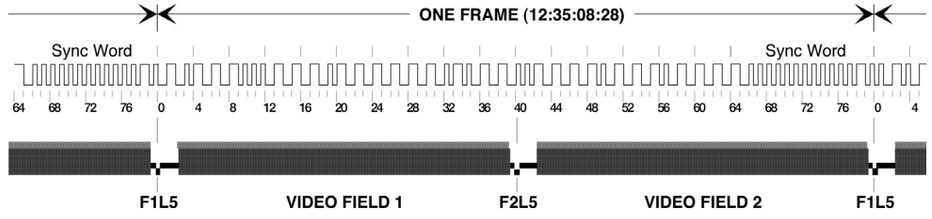
Drop Frame was invented to compensate for that color rate of 29.97. Drop Frame code (DF) leaves certain frame numbers out so that one hour of code time equals one hour of stopwatch time when code is running at 29.97.

In practice, drop and non-drop code can both be generated at a rate of 30 or

29.97 fr/ sec. For that reason, the frame rate and the drop frame status are displayed separately

11.2. VIDEO PHASE

For time code to be synchronous with video, each word of time code must line up exactly with the video frame it describes. This is essential for video editing.



Per SMPTE specifications, the first transition of bit 0 of the codeword must occur at the reference point of the video frame with which it is associated. This video reference point is defined differently depending on the system:

- In analog television systems, it is the start of the vertical sync;
- In digital television systems, it is the start of the video frame;
- In 525/59.95 systems, it is the start of line 4;
- In all other systems, it is the start of line 1.

NOTE: SMPTE time code was developed for analog television operating with rates up to 30 f/s. With digital television, progressive video systems have frame rates up to 50 and 60 f/s. In these systems, counting is done on frame pairs and the video reference point is the start of line 1 of the first frame of the frame pair to which the LTC is associated.

The individual frames should be identified by their timing relative to the LTC with the first frame aligned with LTC bits 0 through 39 and the second frame of the pair aligned with LTC bits 40 through 79.

Video Phase Display

To monitor the sync between time code and video go to the “Video Phase” page on the LCD display by tapping the [UP] or [DOWN] key.

With synchronous code, the display should read: “000.0°”. In the _real world_ however, things are different and phase will often be slightly off. For example, if the address track was misaligned on the VTR, your synchronizer may show some slight sub-frame offset (i.e. 03,12...). So long as you are within a few degrees and that number remains constant, you should have no problems.

Video Phase LED

This LED lights up to indicate that time code is out of phase with video. This means that time code is running at the right speed and is resolved properly but that there is an offset between the two signals.

By default, the SR-112 considers time code in phase with video if the phase is within + or - 20°. If required, this window can be changed by adjusting the “Out Of Phase Threshold” in menu 07. The range is from 0° to 99° (see page 9).

Video Drift LED

This LED indicates that time code is non-synchronous with video.

By default, the SR-112 considers time code as"drifting" when it's alignment with video (video phase) has changed by 2.5% or more. If required, this "Drift Threshold" can be changed in menu 08. The range is 0.1% to 9.9% (see page 9).

WARNING: IF THE PHASE CHANGES, TIME CODE IS ASYNCHRONOUS AND MAY BE USELESS FOR YOUR APPLICATION

11.3 TIME CODE ERRORS

One of the functions of the analyzer is to detect and report time code errors. Errors considered serious enough to cause a problem are labeled "fatal" by the SR-112. Others are "non-fatal". For a complete list, see appendix A.

Reporting Errors on the SR-112 front panel

All "fatal" errors are reported on the front panel; "fatal" and "non fatal" errors are both reported on the printed report.

The 8 digit display:

Every time the SR-112 detects a "fatal" error, the reader is momentarily interrupted and displays a description of the error (i.e. "Drop-out" etc...) for about 2 seconds. Then it returns to its normal mode of operations.

Here is a list of error messages as they are reported on the 8 digit display:

DROP OUT: Drop out - Code interruption for less than 1 second.
CODESTOP: Code Stopped - Code interruption for 1 second or more.
REPEAT: Repeated Frame
DISCONT: Discontinuous Address
INVALID: Invalid Code
VID-LOST: Video Loss - Any interruption in the video signal.
TYPE CHG: Code Type or Format Change
DF CHG: Change in the Drop Frame Status
CF CHG: Change in the Color Frame status
DF ERR: Drp Frame error - received a "00" or "01" frame where there should have been a "02"
RESET: Manual Reset

The beeper:

The beeper sounds when a fatal error is detected. It can be deactivated in menu 06.

Warning LED:

After the SR-112 has detected a "fatal" error, the INPUT ERROR warning LED starts flashing. This way, if you leave the room, you will know if an error occurred while you were away.

To stop the LED from flashing manually, press any key.

The LED automatically stops flashing when the SR-112 is reset.

LCD Display:

Press the [UP] or [DOWN] key until the ERROR page appears on the LCD display. To scroll through the different errors, press the [LEFT] or [RIGHT] keys.

For each error detected, an error description appears on the top line and the faulty address appears on the bottom line.

The left/right arrows are only present when there are more errors in that direction. Right = increasing time codes; Left = decreasing.

The display is normally showing the most recent error, but arrowing to the left will hold it at the error being viewed. It will return to displaying the most recent error if the operator either (a) arrows all the way to the right, or (b) switches to a different display and back (e.g. to the TC In Status display, or to a Menu).

Time Code Report

The report generated by the SR-112 includes:

- a start time,
- an end time,
- all the errors that have occurred between the two.

Start:

A report is initiated automatically whenever code is fed into the SR-112.

The analyzer detects the time code format and the start time. It looks for a video reference and determines the phase between time code and video.

The front panel INPUT ERROR LED is cleared as are the errors reported in the LCD ERROR page (see 5.1) making room for new errors to be reported.

Errors:

As errors are detected they are reported on the front panel and sent via Ethernet to the printed report, as shown above.

TIME CODE REPORT

Stop:

When time code is interrupted for 5 seconds or more, an end of report is automatically initiated and the last valid address becomes the end time.

An end of report can also be initiated manually by doing a manual reset (see 11.4 below).

The time code report is sent to a computer via the Ethernet port. From there, it can be printed if necessary. For more on Ethernet, please refer to chapter 12.

11.4 RESET

As described above, the SR-112 is reset automatically whenever a new report is initiated. However, on occasion, it may be useful to reset manually.

To do a manual reset, press and hold the [SET UP] button for 3 seconds or more. The 8 digit display will confirm this by indicating "- RESET -".

When doing a manual RESET, an end of report is initiated. If it happens while time code is playing, a new report starts immediately.

12. Ethernet

The Ethernet port is used to connect the SR-112 via standard TCP/IP protocol. It enables the user to access the SR-112 remotely, and to upload firmware from any computer on the network.

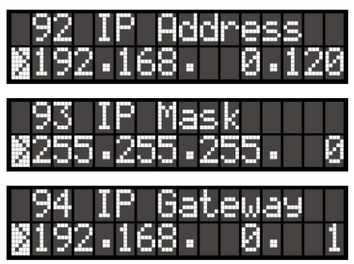
The first thing you need to do is to set the IP address of your SR-112 properly using the front panel keys.

12.1. ETHERNET IP SETTINGS

Menu 91 lets you activate DHCP. When DHCP is on, the server assigns an IP address to the SR-112 automatically along with a subnet mask and a gateway.

Menus 92, 93 and 94 then become status menus, indicating the IP Address, Mask and Gateway but not allowing you to change them.

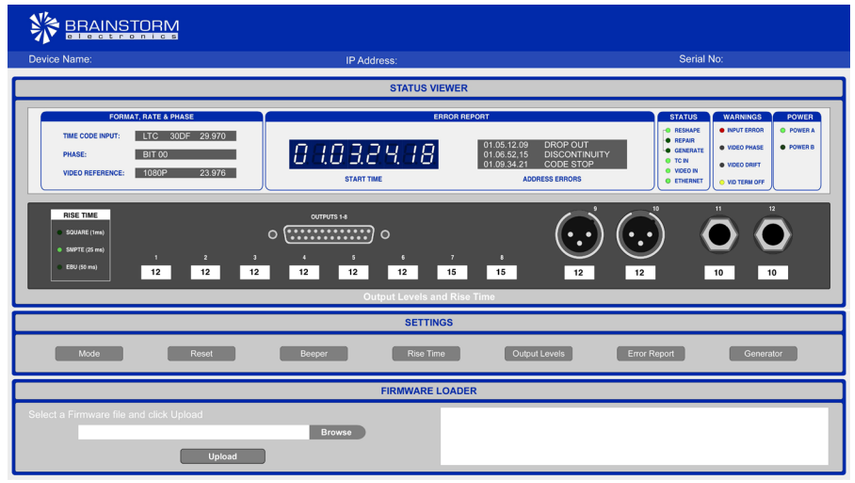
If DHCP is off, then the IP address, mask and gateway must be entered manually in menus 92, 93 and 94.



12.2. SR-112 WEB PAGE

Once your IP settings are entered properly, use any browser (Firefox, Safari ...) and point to the IP address of the SR-112.

The following web page will appear.



This web page is divided in 4 sections:

Header:

Displays the name, the IP address and the serial number of the device.

Status:

All the front panel information is included in this section as well as the output levels and the output rise time setting.

Settings:

7 buttons are included. Clicking on any of them makes a new window pop up.

- MODE: Select between Reshape, Repair or Generate
- RESET: Press reset to reset the SR-112
- BEEPER: Press on or off to activate or deactivate the beeper.
- RISE TIME: Select between square wave (1us), SMPTE (25us), EBU (50us).
- OUTPUT LEVELS: Set the level for each of the 12 outputs from 0 to 99.
- ERROR REPORT: Select a report and right-click to print.
- GENERATOR: for information, please refer to the TCG manual.

Firmware Loader:

This section is used to upload new firmware onto the SR-112.

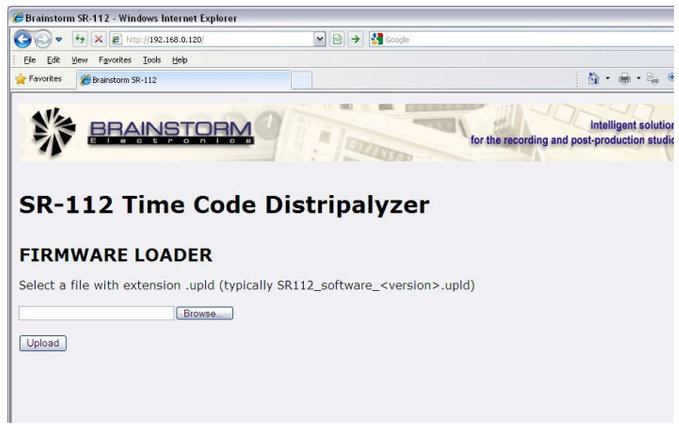
Select a file with the BROWSE button and click the UPLOAD button.

The file should have a .upld suffix, like SR112_software_<version>.upld.

12.3 LOADER

In case of a programming failure, there is a fall-back web page that allows you to restore the SR-112.

To run the Loader, hold the [DOWN] and [SET UP] keys during power up. The following web page will appear.



The only function of this web page is to load new firmware into the SR-112. As with the Loader section of the main page, use the BROWSE button to locate the firmware file on your hard disk and click UPLOAD.

When the Loader is run, prior to any upload and programming activity, the 7-Segment display will show " LoAdEr ", and the following message appears in the LCD:

```
Use Network to
Upload Firmware
```

12.4 PROGRAMMING SEQUENCE

There are 2 steps in the normal programming sequence: Upload and Program. The file is first uploaded and checked, then it is programmed into the SR-112 flash memory.

During this sequence, the 7-Segment display will show all dashes (with regular software also showing the time code decimal points – not so with the Loader), and the LCD will sequence through the following displays:

```
Uploading...
xx% complete
```

```
Uploading...
Done!
```

```
Verifying...
```

(The "Verifying..." display can be missed if the time taken is very short)

```
Programming...
xx% complete
```

```
Programming...
Done!
```

After programming is completed, the unit automatically re-boots and runs the newly programmed software.

Note that during the programming phase, Ethernet is internally disconnected. It is reconnected during the automatic re-boot.

12.5 PROGRAMMING ERRORS

If an error was to occur during the sequence described above, possibly due to a network error, a power failure or a pulled cable, an error message would appear in the LCD display. There are three different messages:

```
Upload ERROR:
Press any key
```

'Upload Error' is not very serious since the error was detected during the upload or during the verification phase and programming had not begun yet. Simply press any key and start again.

```
Flash ERROR:
Press any key
```

'Flash Error' is most likely similar to the previous error. Press any key and start again. However, if the same message reappears right after, it means the corruption occurred after programming had begun and the Loader procedure should be used for restoration (see 12.3).

```
Program ERROR:
Must use LOADER
```

'Program Error' indicates that an error occurred during the programming phase. The only way to restore proper operation is by doing a complete update via the loader (see 12.3).

13. User Bits

User Bits (Binary Groups) can be set to carry different information. Three bits (Binary Group Flags) are used to define this: BGF0, BGF1, BGF2 (see Appendix D for SMPTE & EBU bit assignments).

While in the User Bits page (see 5.1), the SR-112 LCD shows the User Bits and the BGF setting.

```
↕ User Bits In
8bit 55.53.45.52
```

The table below shows the different options available and how they appear on the display:

`|^ User Bits In  |`	
`|---- --.--.--.--|`	User Bits unavailable
`|Unsp 00.00.00.00|`	
`|8bit 55.53.45.52|`	
`|Clk  23.59.59.29|`	
`|Rsvd 00.00.00.00|`	
`|DtTm 00.00.00.00|`	
`|PgLn 00.00.00.00|`	
`|---- 00.00.00.00|`	Binary Group Flag error after too many flag changes

User bits are considered "unavailable" if the input time code is not in forward playspeed mode.

The first 4 characters in each line are derived from the Binary Group Flag bits in the time code stream. The following text from SMPTE 12M-1-2008 has the SR-112 encoding added in:

Binary group flag assignments:

BGF[2:0]	SR-112	Time address reference	Binary group	Other Doc
0 0 0	"Unsp"	Unspecified	Unspecified	
0 0 1	"8bit"	Unspecified	8-bit codes	ISO/IEC 646 or ISO/IEC 2022
0 1 0	"Clk "	Clock time	Unspecified	
0 1 1	"Rsvd"	Reserved	Reserved	
1 0 0	"DtTm"	Unspecified	Date and time zone	SMPTE 309M
1 0 1	"PgLn"	Unspecified	Page/line	SMPTE 262M
1 1 0	"DtTm"	Clock time	Date and time zone	SMPTE 309M
1 1 1	"PgLn"	Clock time	Page/line	SMPTE 262M

When the User Bits are not used, the display will show this:

14. Appendix

APPENDIX A - VIDEO INPUT FORMATS

The following table lists all the video formats recognized by the SR-112 as reference:

525i/29.97 NTSC	1080i/25	1080p/23.976
525i/30	1080i/25 295M	1080p/24
625i/23.976 PAL-	1080i/29.97	1080p/25
625i/24 PAL-	1080i/30	1080p/29.97
625i/25 PAL	1080sF/23.976	1080p/30
	1080sF/24	1080p/50
720p/50	1080sF/25	1080p/50 295M
720p/59.94	1080sF/29.97	1080p/59.94
720p/60	1080sF/30	1080p/60

"PAL-" stands for slow PAL.

Not supported are the low frame rate 720p formats.

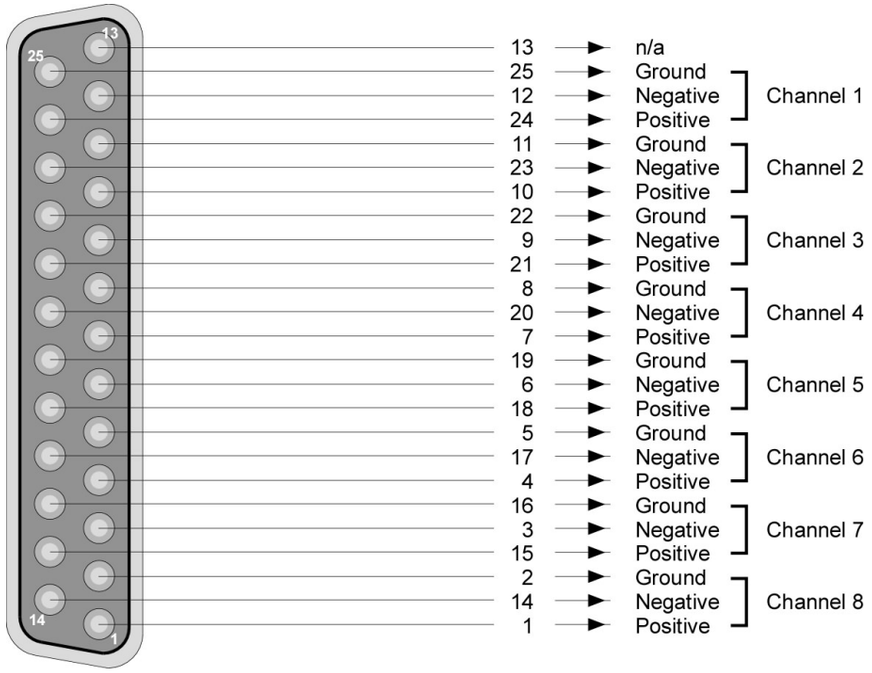
APPENDIX B: TIME CODE ERROR MESSAGES

"Fatal" errors are the ones considered serious enough to cause a synchronization problem. They are reported on the front panel and activate the buzzer; "fatal" and "non fatal"appear on the report, with their corresponding time code address.

FATAL	NON FATAL
Drop out ("DROP OUT")	**Code out of sync**
Time code interruption of less than 1 second. Level has to fall below the input threshold of -30dB	If time code slips by more than 2 bits with respect to video"V"drive
Code Stopped ("CODESTOP")	**Change in User Bits status**
Time code interruption of 1 sec. minimum	Reported if UB flag changes
Repeated Frame ("REPEAT"):	**Undefined User Status**
Same frame address detected twice consecutively	Reported if the binary group flag bits are in undefined combinations
Discontinuous address ("DISCONT")	**Undefined Bit Set**
Any non continuous address (either ascending or descending)	Reported if one of the undefined bits is set (58 - SMPTE & EBU / 10 - EBU)
Invalid Code ("INVALID")	**User Bit Change**
Invalid code	Reported if the User Bits message changes If the SR-112 detects that time code was encoded in the user bits, these UB changes are not reported
Video Loss ("VID-LOST")	**Code Restarted**
Any interruption in the video signal	When Time Code reappears after a "Code Stopped" message
Type Change ("TYPE CHG")	**Video Restarted**
Change in the time code type or format	When video reappears after a "Video Loss" message
Change in DF status ("DF CHG")	**Still Frame**
Drop Frame flag change	A Time Code address is detected consecutively, at lest 3 times
Change in Color status ("CF CHG")	**Play Speed begins**
Color Frame flag change	Start time
Drop Frame Error ("DF ERR")	**Play Speed ends**
A "00" or "01" frame was received where there should have been a "02"	End time
Numeric Error ("CODE ERR")	
General numeric errors are detected such as 32 fr, 25 hrs...	
Reset ("RESET")	
Manual reset	

APPENDIX C - 25 pin D CONNECTOR WIRING DIAGRAM

The diagram below shows the pin out for the 25 pin D-Sub connector (outputs 1-8):



APPENDIX D: LONGITUDINAL BIT ASSIGNMENT - SMPTE & EBU

Each word of LTC is divided into 80 equal segments (bits), numbered 0 to 79. These bits are mainly grouped by four into Binary Coded Decimal words to form decimal numbers (0 to 9). Twenty six of these bits are assigned to the Time Address information (frames, seconds, minutes and hours); thirty two are assigned to the Binary Group information (user bits); sixteen are used for sync (sync word) and the remaining six are used for flags or are still unassigned.

SMPTE has a frame rate of 30 fr/s and EBU 25 fr/s but both time codes have the same 80 bits per word. Most bits are the same but some of the flags are different.

Bit No.	SMPTE	EBU
0	1 FRAME UNITS	1 FRAME UNITS
1	2 FRAME UNITS	2 FRAME UNITS
2	4 FRAME UNITS	4 FRAME UNITS
3	8 FRAME UNITS	8 FRAME UNITS
4	FIRST BINARY GROUP	FIRST BINARY GROUP
5	FIRST BINARY GROUP	FIRST BINARY GROUP
6	FIRST BINARY GROUP	FIRST BINARY GROUP
7	FIRST BINARY GROUP	FIRST BINARY GROUP
8	10 FRAME TENS	10 FRAME TENS
9	20 FRAME TENS	20 FRAME TENS
10	DROP FRAME FLAG	UNASSIGNED ADDRESS BIT 10
11	COLOR FRAME FLAG	COLOR FRAME FLAG
12	SECOND BINARY GROUP	SECOND BINARY GROUP
13	SECOND BINARY GROUP	SECOND BINARY GROUP
14	SECOND BINARY GROUP	SECOND BINARY GROUP
15	SECOND BINARY GROUP	SECOND BINARY GROUP
16	1 SECONDS UNITS	1 SECONDS UNITS
17	2 SECONDS UNITS	2 SECONDS UNITS
18	4 SECONDS UNITS	4 SECONDS UNITS
19	8 SECONDS UNITS	8 SECONDS UNITS
20	THIRD BINARY GROUP	THIRD BINARY GROUP
21	THIRD BINARY GROUP	THIRD BINARY GROUP
22	THIRD BINARY GROUP	THIRD BINARY GROUP
23	THIRD BINARY GROUP	THIRD BINARY GROUP
24	10 SECONDS TENS	10 SECONDS TENS
25	20 SECONDS TENS	20 SECONDS TENS
26	40 SECONDS TENS	40 SECONDS TENS
27	BI-PHASE MARK PHASE CORRECTION BIT	BINARY GROUP FLAG BIT
28	FOURTH BINARY GROUP	FOURTH BINARY GROUP
29	FOURTH BINARY GROUP	FOURTH BINARY GROUP
30	FOURTH BINARY GROUP	FOURTH BINARY GROUP
31	FOURTH BINARY GROUP	FOURTH BINARY GROUP
32	1 MINUTES UNITS	1 MINUTES UNITS
33	2 MINUTES UNITS	2 MINUTES UNITS
34	4 MINUTES UNITS	4 MINUTES UNITS
35	8 MINUTES UNITS	8 MINUTES UNITS
36	FITH BINARY GROUP	FITH BINARY GROUP
37	FITH BINARY GROUP	FITH BINARY GROUP
38	FITH BINARY GROUP	FITH BINARY GROUP
39	FITH BINARY GROUP	FITH BINARY GROUP
40	10 MINUTES TENS	10 MINUTES TENS
41	20 MINUTES TENS	20 MINUTES TENS
42	40 MINUTES TENS	40 MINUTES TENS
43	BINARY GROUP FLAG BIT	BINARY GROUP FLAG BIT
44	SIXTH BINARY GROUP	SIXTH BINARY GROUP
45	SIXTH BINARY GROUP	SIXTH BINARY GROUP
46	SIXTH BINARY GROUP	SIXTH BINARY GROUP
47	SIXTH BINARY GROUP	SIXTH BINARY GROUP
48	1 HOURS UNITS	1 HOURS UNITS
49	2 HOURS UNITS	2 HOURS UNITS
50	4 HOURS UNITS	4 HOURS UNITS
51	8 HOURS UNITS	8 HOURS UNITS
52	SEVENTH BINARY GROUP	SEVENTH BINARY GROUP
53	SEVENTH BINARY GROUP	SEVENTH BINARY GROUP
54	SEVENTH BINARY GROUP	SEVENTH BINARY GROUP
55	SEVENTH BINARY GROUP	SEVENTH BINARY GROUP
56	10 HOURS TENS	10 HOURS TENS
57	20 HOURS TENS	20 HOURS TENS
58	UNASSIGNED ADDRESS BIT 58	UNASSIGNED ADDRESS BIT 58
59	BINARY GROUP FLAG BIT	BI-PHASE MARK PHASE CORRECTION BIT
60	EIGHTH BINARY GROUP	EIGHTH BINARY GROUP
61	EIGHTH BINARY GROUP	EIGHTH BINARY GROUP
62	EIGHTH BINARY GROUP	EIGHTH BINARY GROUP
63	EIGHTH BINARY GROUP	EIGHTH BINARY GROUP
64	SYNC WORD - BIT “ZERO”	SYNC WORD - BIT “ZERO”
65	SYNC WORD - BIT “ZERO”	SYNC WORD - BIT “ZERO”
66	SYNC WORD - BIT “ONE”	SYNC WORD - BIT “ONE”
67	SYNC WORD - BIT “ONE”	SYNC WORD - BIT “ONE”
68	SYNC WORD - BIT “ONE”	SYNC WORD - BIT “ONE”
69	SYNC WORD - BIT “ONE”	SYNC WORD - BIT “ONE”
70	SYNC WORD - BIT “ONE”	SYNC WORD - BIT “ONE”
71	SYNC WORD - BIT “ONE”	SYNC WORD - BIT “ONE”
72	SYNC WORD - BIT “ONE”	SYNC WORD - BIT “ONE”
73	SYNC WORD - BIT “ONE”	SYNC WORD - BIT “ONE”
74	SYNC WORD - BIT “ONE”	SYNC WORD - BIT “ONE”
75	SYNC WORD - BIT “ONE”	SYNC WORD - BIT “ONE”
76	SYNC WORD - BIT “ONE”	SYNC WORD - BIT “ONE”
77	SYNC WORD - BIT “ONE”	SYNC WORD - BIT “ONE”
78	SYNC WORD - BIT “ZERO”	SYNC WORD - BIT “ZERO”
79	SYNC WORD - BIT “ONE”	SYNC WORD - BIT “ONE”